The comet is increasing in brightness, and is moving in a south-easterly direction through Aries and Taurus. On the 17th it passes close to the Pleiades, and on the 30th it is close to α Tauri (Aldebaran). A telegram from Herr Wolf, of Heidelberg, states that the comet is about the 11th magnitude (*Ast. Nach.*, Bd. 148, No. 3552).

Meteor Observations from a Balloon.—The March number of the *Bull. de la Soc. Astr. de France* contains an article by M. A. Hansky, of the Meudon Observatory, describing his attempt to observe the Leonid meteor shower in November 1898 from a balloon. The experiment was so far successful in that the observers saw a number of meteors, the sky to them being perfectly clear, although to the people on *terra firma* in Paris the sky was completely clouded over. This was at a height of only about 150 metres. Attention is also drawn to the other astronomical observations which might be made in this way when otherwise impossible on account of local weather conditions. Among these may be mentioned the observation of solar and lunar eclipses, the zodiacal light, the gegenschein, and auroræ, which last are probably very frequent but masked by atmospheric glare or insufficient transparency of the air at low levels.

The first balloon ascent for astronomical purposes, so far as is known, was made by the Russian chemist Prof. Mendeléef, who, by this means, was enabled to observe the total eclipse of the sun in 1867.

Planetary Perturbations.—In *Ast. Nach.*, Bd. 148, No. 3549, Prof. S. Newcomb draws attention to a source of error in the formulæ used in computing the positions of the planets at future or past epochs. In the method of "special perturbations," which is often used, a small error in the decimal places, arising from superfluous numbers or uncertainty in the data is, from the nature of the integrals, accumulative with the *time*. Prof. Newcomb takes integrals of the various types commonly used, and shows the relative errors introduced in their evaluation. The mean longitude, requiring two integrations for its determination, will have a more rapidly accumulating error than the other elements, and hence its computation should be done with special care.

U.S. Naval Observatory.—We have just received the report of the superintendent of the Naval Observatory for the fiscal year ending June 30, 1898, embodying the several reports made by the directors of the various departments.

The 26-inch refractor has almost exclusively been used on faint and difficult objects, including observations of D'Arrest's and Giacobini's comets; measures of Titan and Japetus for a new determination of the mass of Saturn (1 : 3491·8), this appearing to be affected by the different brightness of the two, so new measures of Rhea and Japetus are to be made; forty-one complete measures of position angle and distance of Neptune's satellite were obtained, and the diameters of Mercury and Venus on all possible occasions.

Some interesting experiments were made to spectroscopically determine the *colour curve* of the 26-inch. The minimum focal length occurs about E, from which the focal plane for F is 0·142 inches, and for G (iron) 1·233 inches distant.

The 12-inch has been used in observing comets, minor planets, occultation of stars, and eclipses of Jupiter's satellites. In past years this instrument has been used for the exhibition of celestial objects to the public on two evenings each week; this has now been limited to one evening. The number of visitors during the year has been nearly 1500.

Two new instruments have been acquired, a 6-inch transit circle and a 5-inch altazimuth, both marking a new departure in being made entirely of steel, in the endeavour to reduce to a minimum the changes due to flexure and temperature. Both instruments have been made by an American firm, this choice being seemingly justified by their performance after installation.

The new tables of the planets Mars, Uranus and Neptune are nearly completed ready for publication.

The department of nautical instruments, chronometers and watches was under a great strain during the war with Spain, all available instruments in the country being purchased, and many having to be sent out without the complete tests usually applied before acceptance.

The magnetic department is likely to be abandoned owing to the serious disturbing effects of the currents leaking from the numerous electric plants in the immediate vicinity.

ALLOYS OF IRON AND NICKEL.

At the Institution of Civil Engineers, on March 28, a paper was read on "Alloys of Iron and Nickel," by Mr. R. A. Hadfield. The effect upon iron of gradually increasing amounts of certain added foreign elements has already been investigated by Mr. Hadfield in experiments upon the mechanical and physical properties of alloys of iron and manganese, silicon, aluminium and chromium, both in the cast and forged conditions. The present paper contains the results of a similar investigation of the alloys of iron and nickel. The addition of nickel, either by conferring greater homogeneity or by some particular combination with the iron or carbon present, or both, appears to confer properties upon the alloy equivalent to an annealing, or, if annealing be employed, to reduce the stress produced by forging; it does this even in the annealed material without injuring or seriously lowering the elastic limit. In this respect, therefore, its presence is of considerable practical utility. It would appear there is considerable room for improving the material of propeller-shafts. The well-known Russian metallurgist, Chernoff, has stated that steel is composed of crystals of metallic iron cemented by carbide of iron, the result being that in the case of nickel-iron alloys the intercrystalline spaces (a subject which has been fully and carefully investigated by Mr. T. Andrews, F.R.S., as regards ordinary steel) are much more completely filled, and the cohesion consequently rendered more powerful. The points of solidification of the cement and crystals are nearer, thus producing or maintaining a more intimate interweaving of the elements. In support of this theory may be cited the fact that without doubt nickel-iron alloys show less tendency to segregation, which apparently indicates that the combinations formed at high temperature are more intimately maintained when the alloy cools and becomes solidified than is the case with ordinary steel. That scientific evolution disregards nationalities is well illustrated in the case of the metal nickel and its developments. The Swedish chemist Cronstedt, at work in his laboratory, conceived the idea that the deceptive Kupfer-Nickel is a metal containing a new element; from him it passed to other Swedish investigators, thence to those of German, French, and other nationalities. Attempts were made by Faraday to artificially produce meteoric iron; similar efforts were afterwards made in France, Germany and elsewhere. Apparently a period of inactivity followed, during which, however, first one and then another experimenter added facts to the general stock. Finally, as regards the metallurgy of nickel as applied to iron and steel, Marbeau, in France, applied the matter experimentally; Schneider, in France, perfected its application to a number of purposes, chiefly armour-plates; Riley brought the manufacture to a practical issue in England; American and Canadian enterprise followed in the perfecting of cheaper methods of producing nickel, and a new product—nickel steel—appeared. It has taken about 125 years to arrive at the stage reached to-day. No one person, no one nationality, can lay claim to its discovery, to its inception. If a chart were constructed on genealogical lines, how much would be seen to have sprung from the laboratory experiments by Cronstedt? But, if it were possible, long before the work of the Swede would be discovered the early workers of the old world in China and Japan, about whose work dates and facts were inaccessible. Apparently, to modern ideas, mention of nickel appears to have struggled into existence between the years 1600 and 1700, but the metal must have been well known, not merely centuries, but almost thousands of years earlier.

THE PRESENT STATE OF EVOLUTION.[1]

Only a little less than fifty years have passed since the publication of Darwin's "Origin of Species," and the general acceptance by naturalists of the theory of descent. Since 1848 the sciences of embryology, cytology, and comparative anatomy based on embryology—or, as it is now called, morphology—have been placed on a firm foundation. It is but little over half a century since the uniformitarian views of Lyell were promulgated. The cell doctrine was born in 1839; the view that protoplasm forms the basis of life was generally received forty years since; fifty years ago the doctrine of the conservation of forces was worked out, and already by this time had the idea of the unity of nature dominated the world of science.

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[1] Prologue of an address entitled "A Half-Century of Evolution, with special reference to the Effect of Geological Changes on Animal Life," delivered by Prof. Alpheus S. Packard before the Section of Zoology of the American Association for the Advancement of Science at the Boston meeting (fiftieth anniversary) on August 22, 1898.

On the fiftieth anniversary, therefore, of our Association, it may not be out of place, during the hour before us, first, briefly to inquire into the present state of evolution and its usefulness to zoologists as a working theory, and then to dwell more at length on the subject of the effect of geological changes on animal life.

The two leading problems which confront us as zoologists are: What is life? and, How did living beings originate? We must leave to coming centuries the solution of the first question, if it can ever be solved; but we can, as regards the second, congratulate ourselves that—thanks to Lamarck, Darwin, and others, in our day and generation—a reasonable and generally accepted solution has been reached.

Time will not allow us to attempt to review the discoveries and opinions which have already been discussed by the founders and leaders of the different schools of evolutionary thought, and which have become the common property of biologists, and are rapidly permeating the world's literature.

It may be observed at the outset that, if there is any single feature which differentiates the second from the first half of this century, it is the general acceptance of the truth of epigenetic evolution as opposed to the preformation or incasement theory, which lingered on and survived until a late date in the first half of the present century.[1] The establishment of the epigenetic view is largely due to exact investigation and modern methods of research, but more especially to the results of modern embryology and to the fairly well digested facts we now have relating to the development of one or more types of each class of the animal kingdom.

To use a current phrase, the evolution theory is now held as come to stay. It is the one indispensable instrument on which the biologist must rely in doing his work. It is now almost an axiomatic truth that evolution is the leaven which has leavened the whole lump of human intellectual activity. It is not too much to claim that evolutionary views, the study of origins, of the beginning of organic life, the genesis of mental phenomena, of social institutions, of the cultural stages of different peoples, and of their art, philosophy, and religion—that this method of natural science has transformed and illuminated the philosophy of the present half-century.[1]

It is naturally a matter of satisfaction and pride to us as zoologists that, though evolution has been in the air from the days of the Greek philosophers down to the time of Lamarck, the modern views as to the origin of variations, of adaptation, of the struggle for existence, of competition, and the preservation of favoured organs or species by selection are the products of single-minded zoologists like Darwin, Wallace, Fritz Müller, Semper, and Haeckel. It is the work of these men, supplemented by the labours of Spencer and of Huxley, and the powerful influence of the botanists, Hooker and Gray, all of whom contributed their life-long toil and efforts in laying the foundation-stones of the theory, which has brought about its general acceptance among thinking men. It is these naturalists, some of them happily still living, who have worked out the principle of evolution from the generalised to the specialised, from the simple to the complex, from chaos to cosmos.

The doctrine of evolution has been firmly established on a scientific basis by many workers in all departments of biology, and found not only to withstand criticism from every quarter, but to be an indispensable tool for the investigator. The strongest proof of its genuine value as a working theory is that it has, under the light shed by it, opened up many an avenue of inquiry leading into new fields of research. It is based on the inductive method, the observation and arrangement of a wide series of facts. Moreover it explains a vast complex of facts, and enables us to make predictions, the true test of a scientific theory. Biology is not an exact science, hence the theory is not capable of demonstration like a problem in mathematics, but is based on probabilities, the circumstantial evidence being apparently convincing to every candid, well-trained mind.

The methods and results of natural science, based as they now are on evolutional grounds, have, likewise, appealed to the historian, the philologist, the sociologist, and the student of comparative religion, whose labours begin with investigations into the origins.

It goes without saying that, thanks to the initiative of the above-named zoologists, every department of intellectual work and thought has been rejuvenated and rehabilitated by the employment of the modern scientific method. All inquiring minds appreciate the fact that, throughout the whole realm of nature, inorganic as well as organic, physical, mental, moral and spiritual, there was once a beginning, and that from a germ, by a gradual process of differentiation or specialisation, the complex fabric of creation has, by the operation of natural laws and forces, been brought into being. All progress is dependent on this evolutionary principle, which involves variation, adaptation, the disuse or rejection of the unfit, the use or survival of the fittest, together with the mechanical principle of the utmost economy of material.

Though the human mind has its limitations, and the chief arguments for evolution have been drawn from our observations of the history of our own planet, and of the life existing upon it, the nebular hypothesis teaches us that the same process has determined the origin of other worlds than ours, and applies in fact to all the other members of our solar system, while with little doubt the principle may be extended to the entire universe.

At all events evolutionary modes of thinking have now become a second nature with philosophic, synthetic minds, and to such any other view is inconceivable. We teach evolution in our colleges and universities, and the time is rapidly approaching, and in some instances has already come, when nature-studies, and the facts of biology forming the grounds of the evolutionary idea, will be taught in our primary and secondary schools.

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[1] The theory of incasement (*emboitment*), propounded by Swammerdam in 1733, was that the form of the larva, pupa and imago of the insects pre-existed in the egg, and even in the ovary; and that the insects in these stages were distinct animals contained one inside the other, like a nest of boxes, or a series of envelopes, one within the other; or, in his own words: "*Animal in animali, seu papilio intra erucam reconditus.*" Réamur (1734) also believed that the caterpillar contained the form of the chrysalis and butterfly, saying: "Les parties des papillon cachées sous le fourreau de chenille sont d'autant plus faciles à trouver que la transformation est plus proche. Elles y sont neanmoins de tout temps." He also believed in the simultaneous existence of two distinct beings in the insect. "Il serait très curieux de connaître toutes les communications intimes qui sont entre la chenille et le papillon . . . La chenille hache, broye, digere les aliments qu'elle distribué au papillon; comme les mères préparent ceux qui sont ports aux fœtus. Notre chenille en un mot est destinée à nourrir et à defendre le papillon qu'elle renferme" (Tome i, 8e Mémoire, p. 363).

It was not until 1815 that Herold exploded this error, though Kirby and Spence in 1828, in their "Introduction to Entomology," combated Herold's views, and maintained that Swammerdam was right. As late as 1834, a century after Swammerdam Lacordaire in his "Introduction à l'Entomologie," declared that "a caterpillar is not a simple animal, but compound," and he actually goes so far as to say that "a caterpillar, at first scarcely as large as a bit of thread, contains its own teguments threefold and even eightfold in number, besides the case of a chrysalis, and a complete butterfly, all lying one inside the other." This view, however, we find is not original with Lacordaire, but was borrowed from Kirby and Spence without acknowledgment. These authors, in their "Introduction to Entomology" (1828), combated Herold's views, and stoutly maintained the old opinions of Swammerdam. They based their opinions on the fact, then known, that certain parts of the imago occur in the caterpillar. On the other hand, Herold denied that the successive skins of the pupa and imago existed as germs, holding that they are formed successively from the "*rete mucosum*," which we suppose to be the hypodermis of later authors. In a slight degree the Swammerdam-Kirby and Spence doctrine was correct, as the imago does arise from germs, *i.e.* the imaginal discs of Weismann, while this was not discovered by Herold, though they do at the outset arise from the hypodermis, his *rete mucosum*. Thus there was a grain of truth in the Swammerdam-Kirby and Spence doctrine, and also a mixture of truth and error in the opinions of Herold.

The discovery by Weismann of the imaginal discs or buds of the imago in the maggot of the fly, and his theory of histolysis, or of the more or less complete destruction of the larval organs by a gradual process, and his observation of the process of building up of the body of the imago from the previously latent larval buds, was one of the triumphs of modern biology. It is therefore not a little strange to see him at the present day advocating a return to the preformation views of the last century in the matter of heredity. Of course it goes without saying, as has always been recognised, that there is something in the constitution of one egg which predestines its becoming an insect, and in that of another, which destines it to produce a chick.

[1] It is worthy of mention that just fifty years ago, in his "Future of Science," written in 1848, at the age of twenty-five, Renan, who first among philosophers and students of comparative philology adopted the scientific method, *i.e.* the patient investigation of as wide a range of facts as possible, wrote: "I am convinced that there is a science of the origins of mankind, and that it will be constructed one day, not by abstract speculation, but by scientific researches. What human life in the actual condition of science would suffice to explore all the sides of this single problem? And still, how can it be resolved without the scientific study of the positive data? And if it be not resolved, how can we say that we know man and mankind? He who would contribute to the solution of this problem, even by a very imperfect essay, would do more for philosophy than by half a century of metaphysical meditation" (p. 150). Again he says: "The great progress of modern thought has been the substitution of the category of *evolution* for the category of the '*being*,' of the conception of the relative for the conception of the absolute, of movement for immobility. Formerly everything was considered as 'being' (an accomplished fact); people spoke of law, of religion, of politics, of poetry in an absolute fashion. At present everything is considered as in the process of formation" (p. 169).

The rapidity with which evolutionary conceptions have taken root and spread may be compared to the rankness of growth of a prepotent plant or animal on being introduced into a new territory where it is free from competition. It has indeed swept everything before it, occupying a field of thought which hitherto had been unworked by human intelligence.

The immediate effect and a very happy one, of the acceptance of the theory of descent on working zoologists, is to broaden their minds. Collectors of insects and shells, or of birds and mammals, instead of being content simply to acquire specimens for their cabinets, are led to look during their field excursions for examples of protective mimicry, or to notice facts bearing on the immediate cause of variation. Instead of a single pair of specimens, it is now realised that hundreds and even thousands collected from stations and habitats wide apart are none too many for the study of variation as now pursued.

The race of "species grinders" is diminishing, and the study of geographical distribution, based as it is on past geographical changes and extinctions, is now discussed in a far more philosophical way than in the past. The most special results of work in cytology and morphology are now affording material for broad work in phylogeny and heredity.

On the other hand it must be confessed that, as the result of the acceptance of evolutionary views, our literature is at times flooded with more or less unsound hypotheses, some tedious verbiage and long-winded, aerial discussions, based rather on assumptions than on facts. But on the whole, perhaps, this is a healthy sign. Too free, exuberant growths will be in the long run lopped off by criticism.

One tendency should be avoided by younger students, that of too early specialisation, and of empirical work without a broad survey of the whole field. In some cases our histologists and morphologists rise little above the intellectual level of species describers. Expert in the use of the microtome and of reagents, they appear to have but little more general scientific or literary culture than high-class mechanics. The chief antidote, however, to the danger of narrowness is the lessons derived from evolutionary thought and principles.

Finally, as a proof of the value of evolutionary ideas to the present generation, let us suppose for a moment, if it were conceivable, that they should be blotted out. The result, it is safe to say, would be equivalent to the loss of a sense.

It is a matter of history that when a new idea or principle or a new movement in philosophy or religion arises, it at first develops along the line of least resistance; the leaders of the new thought acquire many followers or disciples. Soon the latter outstrip their teachers, and go to greater extremes; modifications of the original simple condition or theory occur, and as the final result there arise schisms and differentiations into new sects. This has happened in science, and already we have evolutionists divided into Lamarckians and Darwinians, with a further subdivision of them into Neolamarckians and Neodarwinians, while the latter are often denominated Weismannians. Some prefer to rely on the action of the primary factors of evolution, others believe that Natural Selection embraces all the necessary factors, while still others are thoroughly persuaded of its inadequacy.

The result of this analytical or differentiating process will probably be an ultimate synthesis, a belief that there is a complex of factors at work. Of these factors those originally indicated by Lamarck, with the supplementary ones of competition and natural selection bequeathed by Darwin, are the most essential and indispensable, and it is difficult to see how they can be displaced by other views. Meanwhile all agree, and it was never more firmly established than at this moment, that there is and always has been unceasing energy, movement, and variation, a wonderful adaptation and harmony in nature, between living beings and their surroundings.

The present status of evolution in its different phases or attitudes since the time of the appearance of Darwin's "Origin of Species" may be roughly pointed out as follows:—

(1) The claim by some thinkers of the inadequacy of Darwinism, as such, or Natural Selection, to account for the rise of new species, and the assignment of this factor to what they believe to be its proper place among the other factors of organic evolution.

(2) The renaiscence of Lamarckism under the name of Neolamarckism, being Lamarckism in its modern form. This school relies on the primary factors of evolution, on changes in the environment, such as the agency of the air, light, heat, cold, changes in climate, use and disuse, isolation, and parasitism, while it regards natural, sexual, physiological, germinal and organic selection, competition or its absence, and the inheritance of characters acquired during the lifetime of the individual, as secondary factors, calling into question the adequacy of natural selection as an initial factor.

(3) The rise of the Neodarwinian school. While Darwin, soon after the publication of the "Origin of Species" somewhat changed his views as to the adequacy of natural selection, and favoured changes in the surroundings, food, &c., as causes of variation, his successors, Wallace, Weismann, and others believe in the "all-sufficiency" of natural selection. Weismann also invokes panmixia, or the absence of natural selection, as an important factor; also amixia, and denies the principle of inheritance of acquired characters, or use-inheritance.

(4) A third school or sect has arisen under the leadership of Weismann, who advocates what is in its essence apparently a revival of the exploded preformation, encasement, or "evolution" theory of Swammerdam, Bonnet and Haller, as opposed to the epigenetic evolutionism of Harvey, Wolff, Baer, and the majority of modern embryologists. On the other hand, there are some embryologists who appear to accept the combined action of epigenesis and evolution in development.

(5) Attention has been concentrated on the study of variations and of their cause. Opinion is divided as to whether variation is fortuitous or definite and determined. Many now take exception to the view, originally held by Darwin, that variations are purposeless and fortuitous, believing that they are, for example, dependent on changes in the environment which were determined in early geological periods. For definite variation Eimer proposes the term orthogenesis. Minute variations dependent on climatic and other obscure and not readily appreciable causes are now brought out clearly by a system of varied and careful quantitative measurements.

(6) More attention than formerly is given to the study of dynamical evolution, or kinetogenesis; to the effect of external stimuli, such as intermittent pressure, mechanical stresses and tensions by the muscles, &c., on hard parts. Originally suggested by Herbert Spencer, that the ultimate cause or mechanical genesis of the segmentation of the vertebrate skeleton was due to transverse strains, the segmentation of the bodies of worms and arthropods, as well as of vertebrates, has been discussed by recent workers (Rider, Cope, Meyer, Tornier, Hirsch, and others). Here should be mentioned the work done in general physiology, or morphogenesis, by Verworn, Davenport, and others. Also the discoveries of Pasteur, and the application by Metschnikoff and of Kowalevsky of phagocytosis to the destruction and renewal of tissues during metamorphosis, bear closely on evolutional problems.

(7) A new field of research founded by Semper, Vilmorin, and Plateau, and carried on by De Varigny, is that of experimental evolution, involving the effects of artificial changes of the medium, including temperature, food, variation in the volume of water and of air, absence of exercise, movement, &c. Also should be added horticultural experiments which have been practised for many years, as well as the results of acclimatisation.

Here should be mentioned the experiments bearing on the mechanics of development (Entwickelungsmechanik der organismen), or experimental embryology, of Oscar Hertwig, Roux, Driesch, Morgan and others, and the curious results of animal grafting and of mutilations of the embryos, obtained by Born and others, as well as the regeneration of parts. The remarkable facts of adaptation to new and unfavourable conditions of certain embryos are as yet unexplained, and have led to considerable discussion and research.

(8) The *à priori* speculations of Darwin, Galton, Spencer, Jaeger, Nusbaum, Weismann and others, based on the results of the labours of morphologists and cytologists, have laid the foundation for a theory of the physical basis of heredity, and for the supposition that the chromatin in the nucleus of reproductive cells is the bearer of heredity. The theory has already led to prolonged discussions, and opened up new lines of work in cytology and embryology.

(9) The subject of instinct, discussed from an evolutional point of view, both by morphologists and psychologists, particularly by Lloyd Morgan, has come to the front, while mental evolution has been discussed by Romanes and others.

With all these theories before us, these currents and counter-currents in evolutional thought bearing us rapidly along, at times perhaps carrying us somewhat out of our depth, the conclusion of the whole matter is that in the present state of zoology it will be wise to suspend our judgment on many theoretical matters, to wait for more light, and to confine our attention meanwhile to the observation and registration of facts, to careful experiments, and to repeated tests of mere theoretical assumptions.

Meanwhile we may congratulate ourselves that we have been born and permitted to labour in this nineteenth century, the century which in zoological science has given us the best years of Lamarck's life, a Cuvier, a Darwin, a Von Baer, an Owen, an Agassiz, a Haeckel, a Spencer, and a Huxley—the founders of modern zoology—who have sketched out the grander features of our science so completely, that it will, perhaps, be the work of many coming years to fill in the details.

Prof. Packard discussed in detail the geological causes of variation and of the extinction and renewal of species, but space cannot, unfortunately, be found to reproduce this portion of his address.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

PROF. W. M. DAVIS, who now holds the chair of Physical Geography in Harvard University, has been elected Sturgis Hooper professor of geology in the same university.

UNDER the will of the late Mr. Vincent Stuckey Lean, the Trustees of the British Museum receive 50,000*l.*, to be devoted to the improvement and extension of the library and reading-room of the Museum.

THE Technical Education Board of the London County Council has awarded one of its commercial scholarships to Mr. W. M. Poole, of Magdalen College, Oxford, who is an assistant-master of the Merchant Taylors' School. The scholarship is of the value of 150*l.*, and will enable Mr. Poole to proceed to some of the commercial colleges in foreign countries and study their method of commercial teaching.

THE agricultural experiments carried out by Prof. William Somerville in the counties of Cumberland, Durham, and Northumberland, and the Durham College of Science, Newcastle-upon-Tyne, should prove of distinct benefit to agriculture in the North of England. The work is done in connection with the County Councils of the counties mentioned, and it forms a most valuable branch of technical education. The seventh annual report just issued contains accounts of numerous field experiments, the results of which are of scientific as well as practical value. Satisfactory evidence of interest in this phase of technical education is shown by the fact that a great demand has arisen in the county of Durham for lectures explanatory of the experimental results. Investigation has thus been the means of quickening an interest in the science of agriculture.

AT the ninth meeting of University Extension and other students to be held in Oxford from July 29 to August 23, a number of lectures will be given to illustrate, as far as possible, the more remarkable contributions to science during the period 1837 to 1871. Prof. Francis Gotch, F.R.S., will deal with the physiology of sensation; Prof. E. B. Poulton, F.R.S., will deal with the modes in which the colours, markings, and attitudes of animals are of value for the struggle of life; Prof. W. J. Sollas, F.R.S., will lecture on the geology of Oxford; Prof. H. A. Miers, F.R.S., will lecture on the growth of a crystal; Mr. G. C. Bourne and Mr. A. W. Brown will deal with the growth of the living organism; Dr. Arthur Ransome, F.R.S., will lecture on hygiene; Mr. G. J. Burch on wireless telegraphy; Mr. H. N. Dickson on the influence of climate; and Dr. Reginald Farrar on anthropology. There will also be classes in geology (with field excursions conducted by Prof. Sollas), and in biology.

THE London County Council has delegated to its Technical Education Board such new powers and duties as it has acquired by receiving recognition under Clause vii. of the Directory of the Department of Science and Art (see p. 498). The Board is communicating with the various schools and institutions which are in receipt of grants both from the Board and from the Department, with a view to making the necessary arrangements for carrying out the provisions of Clause vii. The new Board recently appointed consists of twenty representatives from the London County Council, three from the London School Board, two representing the City Parochial Charities Foundation, three appointed by the City and Guilds of London Institute, three from the London Trades Council, and one each from the Incorporated Association of Headmasters and the National Union of Teachers. There are in addition two co-opted members. The Board have decided to introduce some important changes into the regulations for intermediate county scholarships, and the alterations will take effect in the examination to be held in June, 1900.

SCIENTIFIC SERIALS.

American Journal of Science, March.—Studies in the Cyperaceæ, by T. Holm. This article deals with the genus *Lipocarpha*, formerly regarded as a species of Hypælyptum.—The constitution of the ammonium-magnesium phosphate of analysis, by F. A. Gooch and Martha Austin. The presence of ammonium chloride or other ammonium salt is necessary in the precipitation of manganese as the ammonium-manganese phosphate by microcosmic salt, in order that the precipitate may have the ideal constitution NH_4MnPO_4. Further research shows that the chemical constitution of the precipitate rather than mechanical contamination and varying solubility may be responsible for observed variations in the weight of the residue derived by the ignition of the similar salt of magnesium NH_4MgPO_4, precipitated by an excess of a soluble phosphate from the solution of a magnesium salt.—The crystal symmetry of the minerals of the mica group, by T. L. Walker. The examination of crystals not only by the goniometer, but also by the etching progress, and as regards their optical, electric, thermal and cohesive properties, has had the effect of a widespread degradation of crystals from systems of higher to systems of lower degree of symmetry. This tendency is especially shown by minerals of the mica group. Biotite, phlogopite, rubellan and lepidolite are not monoclinic but triclinic, while muscovite is either monoclinic, or, if it be triclinic, it is so very finely polysynthetically twinned that we cannot find a triclinic individual large enough to respond to the optical or etching method.—Imperfectly known and new Actinians, by A. E. Verrill. The specimens described include a new genus *Phelliopsis*, having a general appearance and habit resembling *Phellia*, and two new species, *Anthopleura japonica* and *Bunodactis manni*.—Some American fossil Cycads: Part i., the male flower of Cycadeoidea, by G. R. Wieland. The living Cycads constitute one of the most ornate and characteristic orders of plants, and occupying, as they do, a position on the border-land between the higher Cryptogams and the lower Phanerogams, their ancestral relationship is of considerable interest. The author has examined a collection of rare fossils from the Rocky Mountains, now in the museum of Yale University. The results strengthen the belief that the relation between Ferns and Cycads must have been a very close one.—Footprints of Jurassic Dinosaurs, by O. C. Marsh. One of the most interesting geological discoveries during the past season in the Black Hills region was a locality of footprints made by Dinosaurian reptiles in deposits of Jurassic age. These footprints are the first found in American Jurassic strata. They are all tridactyle, of large size, and were evidently made by some of the great Dinosaurs known to have lived during Jurassic time.—A new Kansas meteorite, by H. L. Ward. This meteorite was found in Ness County, and weighs 417 grms. It no longer has the usual black crust.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 2.—"On Hydrogen Peroxide as the active Agent in producing Pictures on a Photographic Plate in the Dark." By Dr. W. J. Russell, V.P.R.S.

In previous papers the author has been shown that certain bodies are able, in the dark, to act on a photographic plate and produce a picture. The present communication shows that in all the cases which have been examined, and probably in all others of a similar kind, the action which occurs is due directly or indirectly to the presence of hydrogen peroxide.